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Two New Fern Species from Southern Mexico

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ABSTRACT.—*Diplazium errans* and *Polystichum schizophyllum*, endemic to the state of Guerrero, Mexico, are described and illustrated. The former is distinct by its long lanceolate once-pinnate leaves with numerous pinna-pairs and the presence of rhizogenous buds on the rachis toward the blade tip. The latter is distinguished by its tripinnate blades, persistent light-tan indusia, and by marginate, most often black-tipped scales on the stipe and rachis. The relationships of these species within the corresponding genera and especially to their Mexican congeners is discussed.

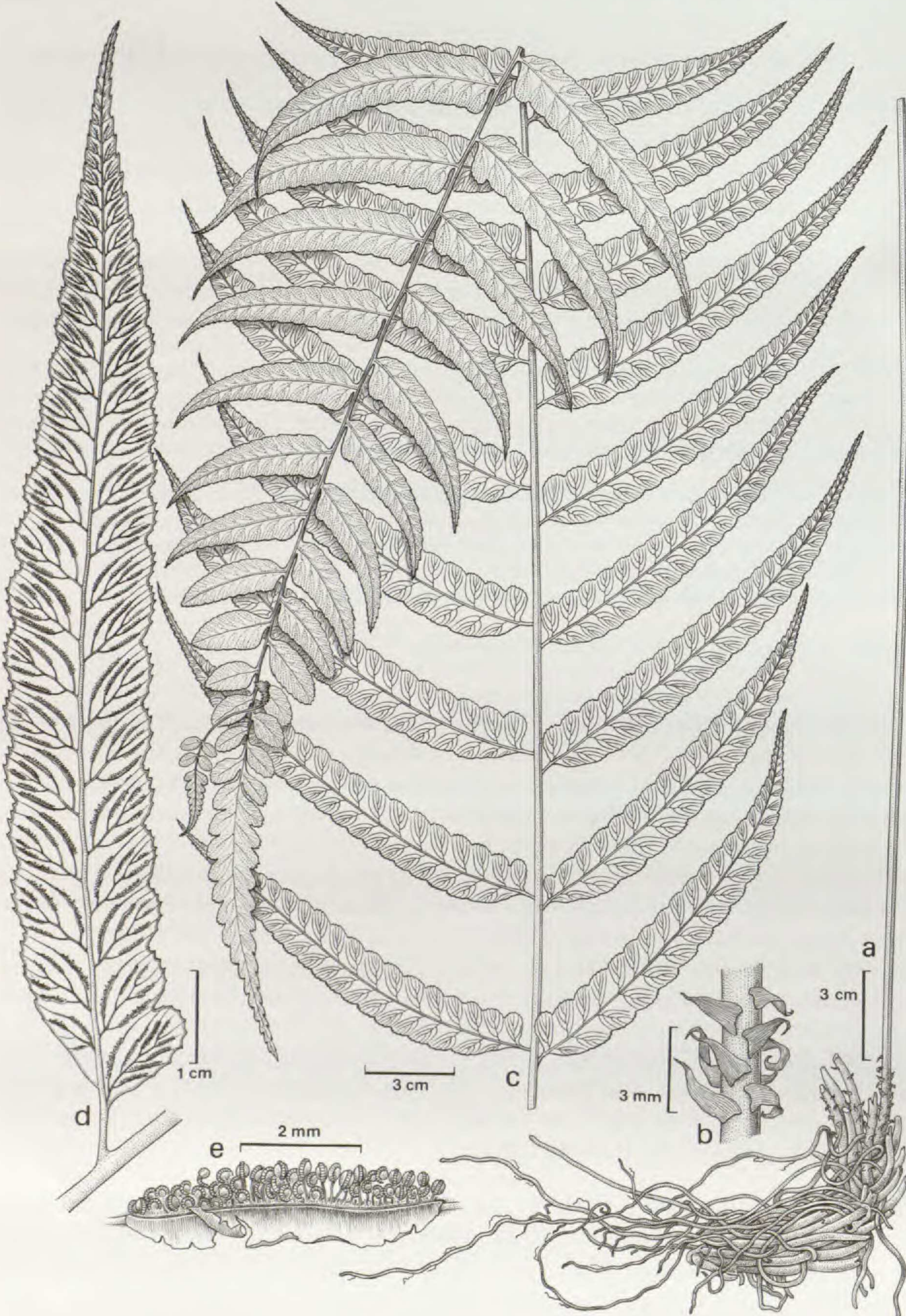
RESUMEN.—Se describen e ilustran *Diplazium errans* y *Polystichum schizophyllum*, especies endémicas del Estado de Guerrero. La primera se distingue por sus largas hojas lanceoladas una vez pinnadas con numerosos pares de pinnas y la presencia de yemas rizógenas en la parte terminal del raquis. La segunda se reconoce por sus hojas tripinnadas, indusios persistentes de color pardo claro y la presencia con frecuencia de escamas marginadas con puntas negras en el pecíolo y raquis. Se comentan además las relaciones de estas especies con otras de los géneros correspondientes, en particular con sus congéneres mexicanos.

In the early 1980s, the state of Guerrero in southern Mexico was targeted as one of the regions for which floristic knowledge was poor. For the last fifteen years, different Mexican research institutions have collected extensively in the state in order to amass collections sufficient to publish a proper floristic account. Part of the outcome of these years of field work has been the discovery of several new plant species. Here we name two of the previously undescribed ferns.

Ferns in Mexico are fairly well known, although relatively few fern floras have been published (Matuda, 1956; Knobloch and Correll, 1962; Smith, 1981; Mickel and Beitel, 1988; Mickel, 1992). The number of pteridophyte species in Mexico is expected to be around 1000 (Riba and Pérez-García, 1994; Mickel and Smith, in prep.). In pteridophyte diversity, the state of Guerrero, with 373 species (Lorea and Velázquez, 1998), is fourth among the Mexican states, behind Oaxaca, Chiapas, and Veracruz. With the description of the following new species, Guerrero now has three endemic pteridophytes, including *Selaginella rzedowskii* Lorea-Hern. (Lorea, 1983).

Diplazium errans Lorea-Hern. & A.R. Sm., sp. nov. (Fig. 1).—TYPE: Mexico, Guerrero, Mpio. Petatlán, 10 km NNE of El Mameyal, dirt road Papanoa-Corrales, 1000 m, 3 Mar 1985, M. G. Campos 1531 (XAL; isotypes NY, UC).

Diplazio werckleano H. Christ affinis, a qua imprimis differt laminis longioribus, pinnis plus quam 20 paribus per frondem (vs. 5–10 paribus in *D. werckleano*), rhachidibus distaliter 1–2 gemmis rhizophoris praeditis.



Diplazium
Ilus. E. Saavedra

Rhizomes ascending to erect; rhizome scales dark brown, lustrous, 0.5×0.5 – 1 mm, lanceolate, entire; fronds clumped, stipes 34–40 cm, $\frac{1}{3}$ – $\frac{2}{5}$ the frond length, pale gray-green or pale yellow-green, adaxially grooved, glabrous except for some scales at base, these dark to light brown and rather dull; blades 52–66 \times 17–22 cm, lanceolate, 1-pinnate, free pinnae (20–) 24 (–28) pairs, apices pinnatifid; rachises grooved, pinna rachis groove open to main rachis groove, lacking hairs but minutely papillate (papillae 0.1 mm long), pale yellowish green, one or two buds developing in pinna axils adaxially on distal fourth of rachis; pinnae ascending, slightly falcate, bases inequilateral, cuneate basiscopically, slightly auricled acroscopically, margins shallowly lobed to undulate and with lobes and undulations faintly serrulate, largest pinnae (usually third pair) 11–15 \times 1.7–2.4 cm, lanceolate, short-stalked (5–7 mm), apices caudate-acuminate, smallest pinnae 0.7–1.3 \times 0.4–0.7 cm, elliptic or rhombic, sessile, apices acute or obtuse; costae and blades glabrous abaxially; veins free, branched 4–6 times (2–3 pairs); sori along 1–3 (–4) acroscopic and also along 1–3 basiscopic veins of a vein group, double sori uncommon, when present along the 1–3 most proximal veins of a vein group; indusia 2.5–9.5 \times 0.2–0.4 mm, entire; spores ca. 64 per sporangium, 44–50 \times 26–32 μ m (including the perine), perine 4–6 μ m thick.

The closest affinity of this species is with *D. werckleanum* H. Christ, which agrees in the presence of once pinnate blades, slightly lobed pinnae, venation, and sori. However, *D. werckleanum* has at most 10 (usually 5–10) free pinna pairs per frond and lacks buds on the rachis, whereas *D. errans* has more than 20 free pinna-pairs per frond and bears buds on the main rachis. *Diplazium werckleanum* is known from southern Mexico (including uncommonly in Guerrero) to Panama and Colombia. *Diplazium werckleanum* belongs to a group of species that have usually been distinguished by the degree of lamina dissection and the inequilateral pinnae. It is especially close to *D. cristatum* (Desr.) Alston, which has more deeply lobed pinnae. Other species in this group, for example *D. drepanolobium* A.R. Sm. and *D. lonchophyllum* Kunze, have free basal acroscopic pinnules and are morphologically less closely related to *D. errans*. None of the species of the *D. werckleanum* group has rhizogenous buds on the rachis.

Other gemmiferous Mexican diplaziums include *D. altissimum* (Jenm.) C. Chr. (bipinnate- pinnatifid blades; syn. = *D. entecnum* Mickel & Beitel), *D. neglectum* (H. Karst.) C. Chr. (once pinnate blade with equilateral pinnae), *D. obscurum* H. Christ (once pinnate blade with a terminal conform pinna), *D. plantaginifolium* (L.) Urb. (simple blade), *D. ternatum* Liebm. (blade ternate, with two lateral pinnae and a conform apical one), *D. urticifolium* H. Christ (once pinnate blade with equilateral pinnae), and *D. vera-pax* (Donn. Sm.) Hieron. (once pinnate blade with pinnatifid apex). Of these, the most similar to *D. errans* is *D. vera-pax*, which occurs in Veracruz and Chiapas. This species

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FIG. 1. *Diplazium errans*. a) rhizome and stipe base; b) stipe base scales; c) blade; d) proximal pinna; e) sorus and indusium, side view.

was synonymized by Adams (1995) under *D. riedelianum* (Bong. ex Kuhn) Kuhn ex C. Chr., a Brazilian species that we regard as distinct. *Diplazium verapax* has only 1–3 free pinna pairs, and is perhaps the hybrid between *D. plantaginifolium*, with simple blades, and *D. werckleanum*. It seems unlikely that *D. errans* is a hybrid, as no other once-pinnate *Diplazium* with inequilateral pinna bases, more than 20 pinna pairs, glabrous blades, and gemmiferous buds is known to occur in Mexico or Mesoamerica. Moreover, the spores of *D. errans* are well-formed (kidney-shaped and perispore with a loose reticulate wing); this argues against a hybrid origin or hybrid status for *D. errans*.

Currently, *Diplazium errans* is known only from the type collection; however, the species was not rare in the area, according to observations by the collector. However, pine-oak forests at ca. 1000 m on the western slopes of the Sierra Madre, where *D. errans* grows, are not common in Guerrero, having been mostly cut for farming and logging operations.

Polystichum schizophyllum Lorea-Hern. & A.R. Sm., sp. nov. (Fig. 2).—TYPE: Mexico, Guerrero, Mpio. Malinaltepec, 4 km S of Paraje Montero, 2000 m, 7 May 1989, F. Lorea 4574 (XAL; isotype UC).

Differt a *P. hartwegii* (Klotzsch) Hieron. laminis 3-pinnatis, 2–10 (–16) segments discretis per pinnulam, segmentis basi constrictis, stipitum paleis indistincte bicoloribus, in medio fuscis, ad apicem interdum denigratis, ad marginem fulvis, indusiis pallide fulvis, ca. 1 mm diam., persistentibus.

Rhizomes erect, massive; fronds clumped, 1–1.4 m, stipes 30–55 cm, stramineous to dark red-brown, sparsely to densely scaly, scales of two types, some somewhat bicolorous with a central, shining, dark brown to blackish band (the distal part sometimes blackish) and wide, translucent, light brown to brown margins, structurally marginate toward the base, 6–20 × 0.8–4.5 mm, lanceolate to ovate-lanceolate, entire to erose or fibrillose toward the tip, more abundant toward the rachis base, not persistent, others light brown, concolorous, dull, 2–9 × 0.1–1.5 mm, capillary to lanceolate, entire or denticulate to long ciliate, more abundant toward the rachis tip; blades 70–92 × 28–42 cm, deltate, tripinnate, free pinnae 32–36 pairs, strongly ascending toward the blade apex, gradually reduced in size to a pinnatifid tip, largest pinnae the third or fourth pair, lowest pinnae 13–22 × 2.5–8 cm, lanceolate-deltate, apices pinnatifid, caudate, free pinnules 20–25 pairs in largest pinnae, larger pinnules (on largest pinnae) each with 2–10 (–16) free segments, these constricted to the midrib, penultimate blade segments inequilateral at base, basiscopically excavated, acroscopically the lobes larger and more spreading or slightly auriculate, margins denticulate-spinulose; rachises and higher order axes grooved, sparsely to conspicuously scaly, scales lanceolate to capillary, light brown, dull, mostly entire or remotely denticulate to short-ciliate, laminar tissue glabrous adaxially, with sparse hairlike scales abaxially; sori 1–6 per ultimate segment; indusia (0.6–) 1 (–1.7) mm in diameter, circular or nearly so, entire, light tan.



FIG. 2. *Polystichum schizophyllum*. a) general view of leaf (basal pairs of pinnae not shown); b) stipe scales; c) proximal pinnule, abaxial view.

PARATYPES.—MEXICO. **Guerrero**. Mpio. Malinaltepec, ca. 5 km N of Paraje Montero, 2210 m, *F. Lorea* 4538 (XAL, UC).

Aside from *P. schizophyllum*, there is only one other Mexican species of *Polystichum* that is fully tripinnate: *P. speciosissimum* (A. Braun ex Kunze) Copel. Nevertheless, these species seem not to be closely related, as suggested in the latter species by the copious concolorous scales along stipes and rachises, the several to many (to 15) pairs of reduced proximal pinnae per frond, the beadlike segments with strongly revoluted margins, and the presence of exindusiate sori.

The presence of black-tinged scales mixed with fibrillose scales along the stipes and rachises in *P. schizophyllum* suggests a relationship to *P. distans* E. Fourn. However, the latter species has bipinnate fronds, more clearly bicolorous scales with a shining black center and narrow light brown margins, and generally smaller indusia. It is likely that *P. schizophyllum* is most closely related to *P. hartwegii* (Klotzsch) Hieron., which also differs in its bipinnate fronds, but with a tendency, in some specimens, to have a nearly free acroscopic lobe on the pinnules. *Polystichum hartwegii* is widespread and variable in many Mexican states, and extends through Mesoamerica and even into northern South America.

Polystichum schizophyllum is known from a small area in the southern half of the Sierra Madre in Guerrero with mixed oak forest. The species is expected to thrive at least in several places where patches of oak forest occur in the mountains of southern Guerrero.

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